FACTS ABOUT SMALLPOX

AND

VACCINATION.

REVISED EDITION.

LONDON: THE BRITISH MEDICAL ASSOCIATION.
1905.

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NOTE.

FOR fuller historical and other information reference may be made to Sir John Simon's Papers on Vaccination, 1857, in great part reproduced in Appendix I of the First Report of the Royal Commission on Vaccination; the Seven Reports and Nine Appendices, issued by the Royal Commission, the Appendices including Reports by Dr. Sidney Coupland, Dr. Theodore Dyke Acland, Dr. A. P. Luff, Dr. T. D. Savill, and Dr. Thomas Barlow; a Review of the Dissentient Royal Commissioners' Statement, in the Epidem. Soc. 'Trans.,' vol. XVI, 1896–7; Supplement to the Local Government Board Report for 1884; Dr. Barry's Sheffield Epidemic Report, Local Government Board, 1889; the Article 'Smallpox and Vaccination' in Stevenson and Murphy's "Hygiene," published by Churchills, 1893; Dr. Monckton Copeman's "Milroy Lectures," published by MacMillans, 1898; Dr. Edward J. Edwardes's "Smallpox and Vaccination in Europe," H. K. Lewis, 1902; the British Medical Journal's "Jenner Centenary Number," published separately, 1896, and its Special Vaccination Number, published separately, 1902; leaflets, and pamphlets of the Jenner Society, obtainable from the Hon. Secretary, Dr. Bond, Gloucester, including pamphlets on the Gloucester and Leicester Epidemics, a Review of Dr. Charles Creighton's writings, &c., &c.; leaflets and pamphlets issued by the Imperial Vaccination League, 53, Berners Street, Oxford Street, London, W., and obtainable from its Hon. Secretary, Mrs. Garrett Anderson, M.D.

FACTS ABOUT SMALLPOX

AND

VACCINATION.

I.—SMALLPOX MORTALITY.

The mortality from smallpox is much less now than in prevaccination times.

Bernouilli, the famous mathematician, calculated that no fewer than 15,000,000 of human beings in the eighteenth century died of smallpox every 25 years. Süssmilch, an eminent statistician of the time of Frederick II, estimated that nearly everyone had smallpox, and that it carried off a twelfth part of mankind. In London, in 1660–79, of every 80,000 deaths, 4,170 were from smallpox. In Iceland, in 1707–9, it killed 18,000 persons in a population of 50,000. In Glasgow, a large and very insanitary town, of 31,088 deaths or burials in 1783–1800 from all causes, 5,959 were due to smallpox. Chester, which on the other hand was described by Dr. Haygarth as a town of "almost incredible" healthiness, had fewer than 15,000 inhabitants, and contained in the year 1775 only 1,060 persons, or one in 14, who had not had smallpox. In Kilmarnock, with 4,000 or 5,000 inhabitants, of every 1,000 children born alive in 1728–64, 161 died of smallpox. In the village of Ware, in Hertfordshire, after an epidemic in 1722, only 302 persons in a population of 2,515 had never had the smallpox

Such examples could easily be added to. Great diminution of smallpox mortality occurred after the introduction of vaccination, not only in places where smallpox inoculation never prevailed, but also in places where smallpox

inoculation had prevailed. The Royal Commission on Vaccination concluded that it is very doubtful whether smallpox inoculation in the eighteenth century did more to diminish smallpox mortality by protecting the inoculated or to increase mortality by spreading the disease amongst the susceptible.

2.—DIMINISHED MORTALITY IN CHILDHOOD.

The greatest diminution in the smallpox mortality is found in the early years of life, in which there is most vaccination.

In Geneva, in the period 1580–1760, during which there were 25,349 smallpox deaths, 961 of every 1,000 were under 10 years of age.

In Chester, in 1774, every one of 202 fatal cases was under 10 years old and a quarter of them were under one year. In Kilmarnock, in 1728–64, of every 1,000 smallpox deaths, 988 were under 10 years of age, and in Edinburgh, in 1764–83, the proportion was 993 per 1,000. In a total of 36,755 deaths from smallpox at all ages occurring in Kilmarnock, Edinburgh, Manchester, Warrington, Chester, Geneva, and the Hague in various pre-vaccination periods from 1580 onwards, 17,252 were under two years of age. In the present day, on the other hand, vaccination being performed in infancy and having its greatest protective influence in the earlier years of life, small-pox has to a great extent departed from childhood and transferred itself to later and less protected ages.

The Royal Commission showed that the cases of smallpox under five years old, including all the unvaccinated, ranged from 312 per 1,000 cases in 1870–4 to 193 in 1885–9 and 283 in 1890–4, this rise in the last quinquennium being related to increasing neglect of vaccination.

In London in 1884, of 1,000 smallpox deaths, 343 were under 10 years old. But this calculation includes both vaccinated and unvaccinated persons. In the vaccinated community the corresponding figures were not 343, but 86; and in the unvaccinated, not 343, but 612. Vaccination, by lessening the

opportunities for infection, and increasing the intervals between epidemics, has helped even the unvaccinated. Yet among the unvaccinated smallpox is still, to a great extent, a disease of childhood.

In prevaccination times, smallpox, measles, and whooping cough were diseases of childhood. Measles and whooping cough are still diseases of childhood, but smallpox, and especially fatal smallpox, has been to a very remarkable extent driven from vaccinated childhood by means of vaccination. What still remains can be driven from later periods of life by means of revaccination.

3.—RELATION OF VACCINATION AND SMALLPOX IN NATIONS.

In countries where there is much vaccination and revaccination relatively to the population, there is little smallpox.

In Germany, both vaccination and revaccination are compulsory, and smallpox mortality is almost abolished.* Beginning with the year 1816, it is found that in Prussia, previous to the German law of 1874, the smallpox death-rate was 309 per annum per million of population. The following comparison is made by Dr. Edwardes:

SMALLPOX DEATHS PER MILLION OF POPULATION.

Prussia.

Before 1874 (1866–74).—620, 432, 188, 194, 175, 2,432, 2,624, 357, 95.
After 1874 (1875–85).—36, 31, 3, 7, 13, 26, 36, 36, 20, 14, 14.
(1886–98).—5, 5, 3, 5, 1, 1, 3, 4, 3, 0·8, 0·2, 0·2, 0·4.

German Empire (average population 52,000,000).

1886–99.—4, 3·5, 2·3, 4·1, 1·2, 1·0, 2·1, 3·1, 1·7, 0·5, 0·2, 0·1, 0·3, 0·5.

Moreover, in Germany the compulsory vaccination age is the second year of life, and investigation showed that in 1886–90 fully two-fifths of the

* As regards the German vaccination laws, see "Smallpox and Vaccination in Europe," by Edward J. Edwardes. Also the translation of the German Vaccination Law, published in the *British Medical Journal*, Sep. 23, 1899, page 789.

few deaths that occurred from smallpox were under two years of age.* Also most of the cases occur near the frontiers of badly vaccinated countries.

In Belgium vaccination is not compulsory, and in 1875–84 it had a rate of 441 per million as compared with Prussia's 22 in the same period. At the time of the European epidemic of 1870–75 Scotland, England, Sweden, and Bavaria had a compulsory vaccination law, and their smallpox rates per million in the worst years were 1,470, 1,830, 1,660, and 1,660 respectively. Prussia, Holland, and Austria had no general compulsory vaccination, and their rates in the worst years were 5,060, 5,490, and 6,180. Coming to 1877–86, with vaccination not compulsory in Austria, with only infantile vaccination compulsory in England, and with vaccination and revaccination compulsory in Prussia, the average death-rate per million from smallpox in the capitals of these three countries was in Vienna 670, in London 250, and in Berlin 10. In London the rate would have been less but for the disease spreading from the smallpox hospitals that it then contained, and it has been very much less since the hospital ships and adjoining hospitals at Long Reach on the Thames came into use for London smallpox.

4.—MUCH VACCINATION, LITTLE SMALLPOX.

In classes among which there is much vaccination and revaccination there is little smallpox.

In epidemics, as in London, Sheffield, and Warrington, revaccinated postmen and policemen remained safe in the midst of exposure to infection. Sir Charles Dilke stated in 1883 that the average strength of the permanent postal service in London was 10,504 in 1870–80, and yet during all that period, including the great epidemic, there was not a single death from smallpox, and only 10 slight cases. In 1891–4, the employees of the General Post Office were over 55,000, yet there were only 17 cases of smallpox and one death, though postmen, owing to the nature of their duties, are specially exposed to infection. In 1892–4, moreover, no less than 109 officers of the postal service were absent from duty owing to smallpox in their houses so that opportunity for infection was not wanting.

* The total deaths from smallpox in the Empire in the five years were 735, and of these 301 were under two years of age.

In the Army and Navy a large majority of the men are successfully revaccinated, and there is very little smallpox—very much less than before revaccination became so prevalent.

No persons are so terribly exposed to infectious diseases as the nurses in fever and smallpox hospitals.

As regards fever nurses, Dr. Collie, Medical Superintendent of Homerton Hospital, declared that "the only way in which nurses become seasoned against fever is by taking the disease." At Homerton, Stockwell, and Liverpool Road Fever Hospitals, in the ten years ending 1881, 133 of the staff were attacked by various fevers, and 25 died. The Gateshead Medical Officer wrote: "Every nurse who has been more than a fortnight in the typhus wards has suffered from typhus." In Newcastle in 1882 only 5 out of 14 nurses escaped typhus, and among the 9 attacks there were two deaths. In the Hospitals of the Metropolitan Asylums Board in 1887–95, no fewer than 704 of the attendants contracted scarlet fever, diphtheria, or enteric fever.

How is it as regards smallpox? At Homerton Hospital in 1871–77 366 persons were employed. All but one were revaccinated, and she was the only one who took smallpox. In the Highgate Hospital the Royal Commission found that since May, 1883, of 137 nurses and attendants 30 had had smallpox before entering the service. Of the other 107 all except the gardener were revaccinated, and the gardener was the only one who took smallpox. In the Sheffield hospitals, in the year ending 31st March, 1888, there were treated 1,798 smallpox patients. The total number of attendants, &c., was 161. Of these 18 had had smallpox previously and escaped attack; 63 had been vaccinated in infancy, of whom six were attacked and one died; the other 80 were successfully revaccinated, and not one contracted smallpox. In Leicester, however, where vaccination is neglected, some of the nurses refused revaccination. In the outbreak there in 1892–3 the total hospital staff consisted of 40 persons. Of these 14 had either had smallpox or been revaccinated before the outbreak, and 20 were vaccinated owing to the outbreak. Among these 34 (14 and 20) one mild case occurred in

a nurse whose revaccination was ten years old. Six of the 40 nurses appear to have been imbued with anti-vaccination opinions, and refused revaccination. Before the end of the epidemic, only one of the six needed any artificial protection against smallpox. Five of them took it and one died.

When smallpox again became epidemic in Leicester in 1903–4 the lesson of the previous outbreak had been learned by the hospital staff. The resident staff numbered 74 in the course of the two years. All (except three who had already had smallpox) had recently been vaccinated, and all escaped smallpox, though, as stated by the Medical Officer, the nurses were "'steeped' in infection continuously." But two workmen, temporarily employed at the hospital, were not revaccinated, and, though never in the wards, both took smallpox.

In Glasgow in 1903 the smallpox hospital was extended during the epidemic. Of 230 workmen employed for the purpose, 217 were successfully revaccinated, and 13 refused, or were overlooked. Of the 217, not one took smallpox, and of the 13, five took it and one died.

The smallpox staff at the hospitals of the Metropolitan Asylums Board in the London epidemic of 1901–2 numbered 974, of whom 494 were nurses. Only two took smallpox and one of these had not been revaccinated because she had had a previous attack of smallpox.

5.—PROPORTION OF VACCINATED AND UNVACCINATED ATTACKED IN COMMUNITIES.

In places where smallpox prevails it attacks a much greater proportion of the unvaccinated than of the vaccinated or revaccinated, especially where the vaccinations and revaccinations are comparatively recent.

In the Homerton Smallpox Hospital in over 10,000 cases treated by Dr. Gayton nearly 21 per cent. were unvaccinated, and among children under 10 the unvaccinated were no less than 47·6 per cent. The unvaccinated at

this time (1873-84) in the population from which the cases were drawn did not amount nearly to 21 per cent., much less 47 per cent. Other hospitals showed similar facts, but Highgate hospital was adduced as yielding a different lesson. It was really the exception which proved the rule. It admitted no children under seven, and drew its patients from a more universally vaccinated section of the population, and therefore the percentage of unvaccinated patients was much less, the difference being due to the difference in the ages of admitted cases, and the difference in the prevalence of vaccination in the population from which cases came.

Dr. Luff investigated for the Royal Commission two outbreaks in London in 1892-3, and found that of 358 children attacked under 10 years old, 228 were not vaccinated, or nearly 64 per cent.; in no part of London did the unvaccinated amount to anything like 64 per cent. of the population.

In Glasgow, from the beginning of 1901 to May, 1902, there were 1,858 cases of smallpox. The population over five years old was estimated at 675,887. The total revaccinations gradually mounted up fortnight by fortnight till they reached 404,855, and the population not recently revaccinated diminished correspondingly. The whole epidemic confined itself to those who were outside this recently protected population. Fortnight by fortnight smallpox picked all its victims from those who had not yielded to the urgent offers of immediate vaccination or revaccination, and fortnight by fortnight it entirely passed by all who accepted the protection, so that among the 404,855 there was not a single case.

6.—PROPORTION OF VACCINATED AND UNVACCINATED ATTACKED IN INVADED HOUSES.

In houses invaded by smallpox in the course of an outbreak not nearly so many of the vaccinated inmates are attacked as of the unvaccinated in proportion to their numbers.

The Royal Commission's Report shows that, taking children under 10 years old, in infected houses in Dewsbury, 10·2 per cent. of the vaccinated

were attacked, and 50·8 per cent. of the unvaccinated ; in Leicester, 2·5 per cent. of the vaccinated, and 35 per cent. of the unvaccinated ; in Gloucester, 8·8 per cent. of the vaccinated, and 46·3 per cent. of the unvaccinated. These places are selected here because they are centres of anti-vaccination, so that it cannot truthfully be alleged that the unvaccinated are weakly children whose vaccination has been postponed by medical certificate. The contention that the vaccinated and unvaccinated children belong to different classes is put out of court by making the comparison between the children in households actually invaded by the disease.

It is alleged by anti-vaccinationists that vaccination does not protect against smallpox, but on the contrary tends to weaken the system against all disease. Yet the vaccinated were attacked in much less proportion than the unvaccinated.

7.—FATALITY AMONG VACCINATED AND UNVACCINATED.

The fatality rate among persons attacked by smallpox is much greater, age for age, among the unvaccinated than among vaccinated.

In prevaccination days sometimes as many as 1 in 3 died, or even a greater proportion, and sometimes as few as 1 in 40. The London Smallpox Hospital had in 1746–63 a fatality rate of 25·3 per cent., and in the last 25 years of the century, 32 per cent. In some towns in Yorkshire, in certain years between 1720 and 1730, the fatality rate in about 18,000 cases was 16·5 per cent. The age of the persons attacked has a most important bearing on fatality, but hardly any prevaccination rates can be checked in this essential particular.

Smallpox fatality rates still vary immensely. In the pandemic of 1870–3 the type was severe, and the fatality high. In recent years two different types have prevailed, one mild, as in America, Trinidad, Nottingham,

and Leicester, and the other severe, as in Gloucester and London. But whatever be the average fatality rate of an epidemic, the disease is much more fatal among the unvaccinated than among the vaccinated.

In the 10,403 cases treated in Homerton Hospital in 1873-84, the deaths among the vaccinated 8,234, were 869 or 10·5 per cent.; among the unvaccinated 2,169, they were 938, or 43·4 per cent. We shall see shortly that the deaths among the well vaccinated were only 3 per cent. In the epidemics investigated by the Royal Commission in three towns, Dewsbury, Leicester, and Gloucester, where vaccination has been neglected, we find that under 10 years of age, among 72 vaccinated children attacked, two died or 2·7 per cent.; but among 961 unvaccinated children attacked 350 died, or 37·3 per cent. Over 10 years of age, among 1,959 vaccinated persons attacked, there were 136 deaths, or 6·9 per cent., and among 331 unvaccinated persons there were 75 deaths, or 22·6 per cent. Again it is to be noted that as vaccination was practically optional in these towns, the unvaccinated children, according to anti-vaccination theories, should have been more able to resist death by smallpox than those who had been subjected to an operation which is alleged to weaken the system and render it more liable to disease and death.

In the London epidemic of 1901–2 there were treated in the hospitals of the Metropolitan Asylums Board 9,659 cases of smallpox, of which 1,629 proved fatal. Among 6,945 vaccinated cases, including good, bad, and indifferent vaccinations, and including all ages, the deaths were 705, or 11·5 per cent. Among 2,278 unvaccinated cases the deaths were 753 or 33·1 per cent. Among the vaccinated only 134 were under 10 years old, and only 2 of these died, or 1·5 per cent. Among the unvaccinated, 1,274 were under 10 years old, and 442 died, or 34·7 per cent. There were 436 doubtful cases where no vaccination marks could be seen, and the evidence as to vaccination was inconclusive, and of these 171 died; they may be added to either all-age group without materially altering the fatality rates.

8.—PROTECTION VARIES WITH THE EFFICIENCY OF VACCINATION.

The degree of protection conferred by vaccination corresponds to the thoroughness with which the operation has been performed, three or four marks being much better than one or two, and a large mark much better than a small one.

In Dr. Gayton's 10,403 cases at the Homerton Hospital, 2,085 had good marks, and the fatality rate was 3 per cent.; 4,854 had indifferent marks, and the fatality rate was 9 per cent.; 1,295 were alleged to be vaccinated, but had no marks, and the fatality rate was 27 per cent.; and 2,169 were unvaccinated, and the fatality rate was 43 per cent. Taking "good" marks only, and attending to their numbers, Dr. Gayton found that with one mark the fatality rate was 4·1 per cent.; with two marks, 3·3 per cent.; with three marks, 2·3 per cent.; with four or more marks, 1·5 per cent. The cases on which these percentages are founded numbered 529, 649, 518, and 389 respectively. Taking 6,839 cases observed in more recent years, the Royal Commission found that the smallpox fatality rate in persons with one mark was 6·2 per cent.; with two marks, 5·8 per cent.; with three marks, 3·7 per cent.; and with four marks, 2·2 per cent.

Though revaccination occasionally leaves very faint scars, which almost disappear in time, yet the scars of primary vaccination are on any reasonable number of observations, very fairly indicative of the original areas of vesiculation, and are quite trustworthy for statistical purposes.

It is comparatively seldom that cases come to hospital with the smallpox eruption so far advanced and profuse as to obscure the vaccination marks but in hospital statistics in this country a column is provided for "doubtful" cases, and if the figures for any large hospital be examined it will be seen that the inclusion of such cases either as "vaccinated" or "unvaccinated" does not alter the lesson taught by the statistics.

9.—SANITATION AND SMALLPOX.

Sanitation cannot account for the facts above set forth.

Whooping cough and measles deaths still belong to childhood as in the last century, while smallpox deaths have been removed from childhood to later periods of life. How could sanitation account for this differentiation? If it be suggested that because sanitation confers a special benefit on children it may have altered the age incidence of smallpox, the answer is got by looking at facts.

In Germany, as we have seen, vaccination is not compulsory till the second year, and over 40 per cent. of all the smallpox deaths were found to be under two years of age.

In Scotland, the vaccination age is six months, and children under six months make just about the same contribution (138 deaths per 1,000 deaths) to the total smallpox deaths as they did (139 deaths per 1,000) before the vaccination law was passed. But in the next half-year of life—the half-year of vaccination—the contribution has fallen from 153 to 47. Surely this is vaccination and not sanitation.

In a community attacked by smallpox how could sanitation at home protect postmen going from door to door day after day in infected districts?

In Leicester, how could sanitation account for the revaccinated nurses escaping smallpox, and the nurses who had refused revaccination taking smallpox?

How could sanitation cause smallpox to pass over vaccinated children and seize on unvaccinated children in houses invaded by smallpox in Dewsbury and Leicester and Gloucester?

How can sanitation have caused the fatality of smallpox cases to be much less among the vaccinated than among the unvaccinated in these towns, especially if vaccination weakens the system and makes it less resistant to disease as is alleged by anti-vaccinationists?

How could sanitation cause children with three or four vaccination marks to have a smaller fatality from smallpox than children with one or two vaccination marks ?

In Glasgow, while sanitation was going from bad to worse in the early part of last century, vaccination was introduced and smallpox underwent an enormous diminution, though hospitals and isolation and disinfection were entirely out of the question.

In Gloucester vaccination had been neglected, and in 1891 the Secretary to the Anti-vaccination League declared to the Royal Commission that Gloucester was a very clean town, and had always been well abreast of sanitary improvements, and that its death-rate was very low. The Board of Guardians also wrote to the Commission on the same lines. But smallpox came, and the town suffered from a terrible epidemic, and ever since then the anti-vaccinationists have been declaring that there was a great want of sanitation in Gloucester. What was wanting was vaccination.

The Dewsbury Union has long been triumphantly pointed to by anti-vaccinationists as a place which had learned to do without vaccination, and in great measure it has also followed the old anti-vaccination creed that smallpox "is one of the least contagious diseases," and that cases should not be sent to hospital. Naturally, therefore, the Dewsbury Union has repeatedly had smallpox outbreaks, and the cases in its most recent epidemic had mounted to 1,302 by the end of 1904. Whilst the disease was rapidly spreading, the Guardians, led by an anti-vaccinist, still refused to carry out their duties under the Vaccination Acts, and in these circumstances the Local Government Board issued an Order empowering and requiring certain of the sanitary authorities, including the Dewsbury Town Council, to promote vaccination by the provision of every public facility for its performance The Order was violently attacked by the *Vaccination Inquirer* and one or two London newspapers, but nevertheless it was vigorously applied, and whilom anti-vaccinists hurried to get vaccinated, so that smallpox rapidly declined, and in January, 1905, there were only 39 cases, in February 2 cases, and in March 1 case, the last of the outbreak.

10.—SMALLPOX ISOLATION HOSPITALS.

Though isolation of smallpox cases in hospitals is a useful auxiliary to vaccination, it is no substitute for it, and smallpox hospitals are most expensive.

In an unvaccinated nation it would be utterly impracticable to provide sufficient smallpox hospitals. Their cost would be tremendous. London, though not a fifth of its population is unvaccinated, requires to maintain large hospitals, with a total of about 2,500 beds, for smallpox, and these hospitals have to be situated far from any centres of population in order, if possible, to prevent spread of infection from them. Berlin, on the other hand, for its population of about two millions, maintains, as reported by Dr. Bruce Low, of the Local Government Board, *only twelve beds for smallpox in a pavilion in one of its general hospitals within the city.* Other German towns have arrangements on a somewhat similar scale. Dr. Bruce Low's report has effectually destroyed a favourite anti-vaccination fiction, that Germany's freedom from smallpox is due to its isolation system.

For whooping cough and measles hospital accommodation has not been seriously attempted, though these diseases cause an enormous mortality. Where, owing to vaccination, liability to smallpox is limited, hospitals are very useful and help to give time for general revaccination. But in an unprotected community they are almost certain to break down. Who would have attended to the sick in Leicester if all nurses had had the same experience as those in 1893–4, who refused revaccination?

In less than two years, beginning December, 1902, Leicester had 715 notified cases of smallpox, notwithstanding that the type of the disease was very mild and its infectivity correspondingly low. The so-called "Leicester Method," as described by the well-known Leicester anti-vaccinationist, Mr. J. T. Biggs, purports to prevent smallpox "without recourse to vaccination." But when smallpox comes, the medical officer, speaking of vaccination of contacts, states that he "freely resorted to it during the epidemic." In 1903 the list of contacts was 1,084, and of these he "induced nearly 800 persons (living in invaded houses) to submit to vaccination,

almost all of whom were disbelievers in and actually hostile to vaccination in any form."* Also, as already noted at p. 10, there were no exceptions this time among the hospital nurses; all were revaccinated and all escaped smallpox. This is included in the Leicester method *in practice*. *In theory* it is "without recourse to vaccination." The "Method," as described by its anti-vaccinating advocates is only acted on in Leicester when there is no smallpox. When smallpox comes Leicester resorts to vaccination, though to a very incomplete extent. Though barely 10 per cent. of births in recent years are certified as vaccinated, the medical officer states that a test census of over 1,000 houses indicated that about 62 per cent. of the population have been vaccinated at some time in their lives. When smallpox prevailed in 1893, the Health Committee recommended vaccination, but were not straightforward enough to call it by its own name. After recommending hospital isolation of patients, quarantine of contacts, and disinfection of houses and clothing, they went on to say, "We are also of opinion that all persons who are frequently brought into contact with smallpox patients should adopt all protective measures known to science."

In an unprotected community instead of smallpox being limited, it would spread in rapidly widening circles. Where a person protects himself by vaccination and revaccination he can defy smallpox. He carries his protection with him wherever he goes, and a father can obtain protection both for himself and his family.

Even if isolation in hospitals were made more stringently compulsory than vaccination has ever been in this country there could be no complete security. The protection of the individual might fail at any moment. It would depend not on himself but on other people. His cordon of protection would be a chain the measure of whose strength would be its feeblest link, and over not one link would he have efficient control. Failure of parents to observe the symptoms of illness; failure to call in a doctor; failure of the doctor to recognize smallpox; failure in promptitude of removal; inadequacy

* In his Report for 1902 the Medical Officer wrote that "it should be clearly recognized that all those Medical Officers of Health who have carried out the 'system' have been firm believers in Vaccination, and have not hesitated to make as full use of it as possible, short of compulsion, where the occasion for it has occurred." The Medical Officer, however, appears to think compulsory Vaccination unnecessary, but he admits that a conclusion to that effect cannot be based on an outbreak where the type of smallpox was so mild as in the recent Leicester epidemic.

of hospital accommodation; insufficiency of disinfection of persons and things —these would be among the risks to which even a law of compulsory isolation would leave him exposed. Obviously the risk of collapse of voluntary isolation would be much greater.

II.—SAFETY OF VACCINATION.

Vaccination is very safe.

Nothing done by human beings is entirely without risk, but the risks of vaccination have been grossly exaggerated.

Some of the earliest anti-vaccinists held that the countenance of a vaccinated child might be transformed so as to assume "the visage of a cow." Later on, in the middle of last century, vaccination was accused of making people bald-headed, shortsighted, lazy, and of causing degeneracy in music, painting, oratory, poetry, &c.

Still later, the habit has been to get statistical returns of increasing and decreasing diseases from the Registrar-General, and to attribute the increasing diseases to vaccination, and to use the decreasing diseases to illustrate the view that smallpox also might decrease without vaccination. But a disease may be increasing at one time and decreasing at another. Thus at one time cholera and enteric fever and scarlet fever were blamed on vaccination, but when these diseases began to decrease, their decrease was, and still is, held to show the needlessness of vaccination.

One foul disease in particular used to be attributed to vaccination, but when the Royal Commission looked into the matter they found that after vaccination of Leicester infants had been largely given up that disease had increased there much more rapidly among infants than in the rest of England.

So also erysipelas, while it decreased in England by 16 per cent., increased in Leicester by 41 per cent. Similarly, diarrhœa, dysentery, and bronchitis, all of which have been attributed to vaccination, increased much more in Leicester than in England. The periods under comparison are 1863–67 and

1883-87. It is not to be supposed that the increase in these diseases was due to want of vaccination, but if instead of increasing they had diminished in Leicester, their diminution would, without doubt, have been attributed by anti-vaccinationists to diminution in vaccination, just as increase of many sorts of disease has been attributed by them to vaccination where vaccination is not neglected as in Leicester.

The Royal Commission made most careful search for injuries resulting from vaccination, and, after the fullest consideration, arrived at the deliberate conclusion that such injuries were "insignificant" and "diminishing," and could be still further diminished. So insignificant were they that vaccination has been nowhere more nearly universal than in the families of medical men, who love their children as other men do, and who know much better than other men can do the exceeding safety of vaccination.

12.—SYSTEMATIC REVACCINATION.

For the prevention of smallpox, systematic national revaccination is the outstanding requirement of this country in the present day.

Germany, which for many years has had the benefit of systematic primary vaccination and revaccination, is practically free from smallpox, and its smallpox hospital accommodation is merely nominal. When the Vaccination Act of 1898 was before Parliament, statements made on behalf of the Government led to the expectation that an Act providing for revaccination, subject to the so-called "conscience clause," would be introduced in the following session. This hope was not fulfilled, and every outbreak of smallpox proves the continuing necessity of obligatory revaccination. Every reasonable opportunity should be taken by members of the medical profession to call the attention of Members of Parliament and of candidates for Parliament to this necessity.

13.—CALF LYMPH.

Calf lymph is now available for the vaccination of every child in the country.

Reverting to the foul disease which has formed the principal allegation by anti-vaccinationists, it is to be noted that the use of calf lymph makes its occurrence through vaccination an absolute impossibility, as calves are not subject to that disease.

Any wound, no matter how trifling, may occasionally go wrong, and be followed by erysipelas, or sloughing, or ulceration, but as we have seen, while erysipelas decreased in England by 16 per cent., it increased in anti-vaccinating Leicester by 41 per cent. The aseptic precautions which are now used are most valuable in diminishing even the very trivial possibility of mischief which formerly accompanied infantile vaccination, and if all school children were systematically revaccinated at twelve years of age there would be no occasion for sore arms being induced by heavy physical labour immediately after revaccination in later years, for such later revaccination would be unnecessary.

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V. = Vaccination. Sp. = Smallpox. Stat. = Statistics. M.A.B. = Metropolitan Asylums Board.

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The mortality from smallpox is much less now than in pre-vaccination times.

2.—DIMINISHED MORTALITY IN CHILDHOOD.

The greatest diminution in the smallpox mortality is found in the early years of life, in which there is most vaccination.

3.—RELATION OF VACCINATION AND SMALLPOX IN NATIONS.

In countries where there is much vaccination and revaccination relatively to the population, there is little smallpox.

4.—MUCH VACCINATION, LITTLE SMALLPOX.

In classes among which there is much vaccination and revaccination there is little smallpox.

5.—PROPORTION OF VACCINATED AND UNVACCINATED ATTACKED IN COMMUNITIES.

In places where smallpox prevails it attacks a much greater proportion of the unvaccinated than of the vaccinated or re-vaccinated, specially where the vaccinations and revaccinations are comparatively recent.

6.—PROPORTION OF VACCINATED AND UNVACCINATED ATTACKED IN INVADED HOUSES.

In houses invaded by smallpox in the course of an outbreak not nearly so many of the vaccinated inmates are attacked as of the unvaccinated in proportion to their numbers.

1905.

7.—FATALITY AMONG VACCINATED AND UNVACCINATED.

The fatality rate among persons attacked by smallpox is much greater, age for age, among the unvaccinated than among vaccinated.

8.—PROTECTION VARIES WITH THE EFFICIENCY OF VACCINATION.

The degree of protection conferred by vaccination corresponds to the thoroughness with which the operation has been performed, three or four marks being much better than one or two, and a large mark much better than a small one.

9.—SANITATION AND SMALLPOX.

Sanitation cannot account for the facts above set forth.

10.—SMALLPOX ISOLATION HOSPITALS.

Though isolation of smallpox cases in hospitals is a useful auxiliary to vaccination, it is no substitute for it, and smallpox hospitals are most expensive.

11.—SAFETY OF VACCINATION.

Vaccination is very safe.

12.—SYSTEMATIC REVACCINATION.

For the prevention of smallpox, systematic national revaccination is the outstanding requirement of this country in the present day.

13.—CALF LYMPH.

Calf lymph is now available for the vaccination of every child in the country.

For fuller particulars apply to—

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